Interplay between data and models in deep learning: a geometric perspective

Ecole Nationale de l'Aviation Civile (ENAC)
Toulouse, 17-18 juin 2025

Workshop program

Amphitheatre Bellonte
ENAC, June 17-18, 2025

with the support of

Workshop Program

Amphitheatre Bellonte - ENAC, June 17-18, 2025
Workshop website: https://geomdatamodels.sciencesconf.org/

1 Scientific & Organizing Committee

- **Francesco Costantino** (Université de Toulouse)
- **Nicolas Couëllan** (Ecole Nationale de l'Aviation Civile)
- **Florence Nicol** (Ecole Nationale de l'Aviation Civile)
- **Stéphane Puechmorel** (Ecole Nationale de l'Aviation Civile)
- **Eliot Tron** (Ecole Nationale de l'Aviation Civile)
- **Alice Barbara Tumpach** (Université de Lille)

2 Speakers & talk titles

- **Stéphanie Allassonnière** (Université Paris Cité)
"Taking advantage of geometry in Variational Autoencoders"
- **Pierre Baudot** (Median technology)
"Information cohomology and higher-order statistical interactions: theory and ML/AI applications"
- **Daniel Bennequin** (Institut de Mathématiques de Jussieu-Paris Rive Gauche)
"Homotopy semantics in LLMs, from data, learning and architectures"
- **Michel Boyom** (Institut Montpelliérain Alexander Grothendieck)
"Koszul homological series and Fedosov foliations on statistical manifolds"
- **Mathieu Carrière** (INRIA Université Côte d'Azur)
"Diffeomorphic interpolation for efficient topological optimization"
- **Rita Fioresi** (Università di Bologna)
"Manifold Learning via Foliations and Knowledge Transfer"
- **Matthieu Jonckheere** (LAAS-CNRS)
" Fermat distance: inferring meaningful distances for machine learning tasks"
- **Emanuele Latini** (Università di Bologna)
"On contact structures"
- **Alexey Lazarev** (Université de Toulouse)
"Curvature regularization and Riemannian clustering in the latent space of an autoencoder"
- **Alice Le Brigant** (Université Paris 1 Panthéon-Sorbonne)
"The different ways to interpolate between probability distributions in information geometry"
- **Mathieu Serrurier** (Université de Toulouse)
"Self-Supervised Learning with 1-Lipschitz Constraints"
- **Alice Barbara Tumpach** (Université de Lille)
"Infinite-dimensional Geometry and AI"
- **Hong Van Le** (Czech Academy of Sciences)
"Probabilistic morphisms and Bayesian supervised learning"

INTERPLAY BETWEEN DATA AND MODELS IN DEEP LEARNING FROM A GEOMETRIC PERSPECTIVE

17 JUIN 2025 ENAC

08:00 - 08:45	ACCUEIL
08:45 - 09:00	WELCOME SPEECH
09:00 - 10:00	MATTHIEU JONCKEERE. FERMAT DISTANCE: INFERRING MEANINGFUL DISTANCES FOR MACHINE LEARNING TASKS”
10:00 - 10:30	COFFEE BREAK
10:30 - 11:30	HONG VAN LE. PROBABILISTIC MORPHISMS AND BAYESIAN SUPERVISED LEARNING.
11:30 - 12:30	ALICE BARBARA TUMPACH.INFINITE-DIMENSIONAL GEOMETRY AND AI
12:30 - 14:00	LUNCH BREAK
14:00 - 15:00	MICHEL BOYOM. KOSZUL HOMOLOGICAL SERIES AND FEDOSOV FOLIATIONS ON STATISTICAL MANIFOLDS
15:00 - 16:00	DANIEL BENNEQUIN (VISIO).HOMOTOPY SEMANTICS IN LLMS, FROM DATA, LEARNING AND ARCHITECTURES
16:00 - 17:00	MATTHIEU SERRURIER. SELF-SUPERVISED LEARNING WITH 1-LIPSCHITZ CONSTRAINTS

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INTERPLAY BETWEEN DATA AND MODELS IN DEEP LEARNING FROM A GEOMETRIC PERSPECTIVE

18 JUIN 2025 ENAC

08:00 - 09:00	RITA FIORESI. MANIFOLD LEARNING VIA FOLIATIONS AND KNOWLEDGE TRANSFER
09:00 - 10:00	ALICE LE BRIGANT. PRINCIPAL COMPONENT ANALYSIS OF A SET OF PROBABILITY MEASURES UNDER THE WASSERSTEIN METRIC
10:00 - 10:30	COFFE BREAK
10:30 - 11:30	EMANUELE LATINI. ON CONTACT STRUCTURES.
11:30 - 12:30	MATTHIEU CARRIERE. DIFFEOMORPHIC INTERPOLATION FOR EFFICIENT TOPOLOGICAL OPTIMIZATION
12:30 - 13:30	LUNCH BREAK
13:30 - 14:30	STEPHANIE ALLASSONNIERE (VISIO). TAKING ADVANTAGE OF GEOMETRY IN VARIATIONAL AUTOENCODERS
14:30 - 15:30	PIERRE BAUDOT. INFORMATION COHOMOLOGY AND HIGHER-ORDER STATISTICAL INTERACTIONS: THEORY AND ML/AI APPLICATIONS
15:30 - 16:30	ALEXEI LAZAREV. CURVATURE REGULARIZATION AND RIEMANNIAN CLUSTERING IN THE LATENT SPACE OF AN AUTOENCODE

END OF MEETING